USGS

Sound Waves Coastal and Marine Research News from Across the USGS

http://soundwaves.usgs.gov/

Fieldwork

Elwha Dam Removal Begins—Long-Planned Project Will Restore Ecosystem, Salmon Runs

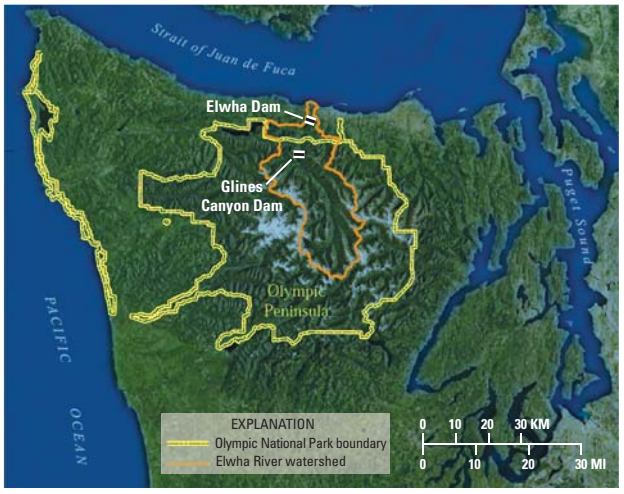
By Jonathan A. Warrick

The largest dam-removal project in U.S. history—the Elwha River Restoration Project—commenced during the second week of September 2011, when National Park Service contractors began to dismantle two dams on the Elwha River in Washington State. The 32-m-tall Elwha Dam and the 64-m-tall Glines Canyon Dam, completed in 1913 and 1927, respectively, have been blocking the natural supply of sediment to the lower river and coast and severely limiting salmon and steelhead spawning for nearly a century. In a ceremony celebrating the beginning of the Elwha River restoration, Secretary of the Interior **Ken Salazar** praised the project, saying, "America's rivers are the lifeblood of America's economy—from the water for farms that produce our food to the fish and wildlife that sustain our heritage." He added that restoration will help support the culture of the Lower Elwha Klallam Tribe, who have lived along the river for centuries.

The Elwha River Ecosystem and Fisheries Restoration Act, passed by Congress in 1992, directed the Secretary of the Interior to study ways to fully restore the Elwha River ecosystem and native anadromous fisheries. (Anadromous fish, such as salmon and steelhead, spend most of their lives at sea but return to freshwater to breed.) In 2000, the federal government purchased the dams and related facilities, and on Saturday, September 17, 2011, removal of the dams began. News of this event appeared throughout the national media, including the *New York Times*, the *Washington Post*, National Public Radio, and the Associated Press.

To kick off the unprecedented restoration, the Olympic National Park and the Lower Elwha Klallam Tribe sponsored a week of festivities titled "Celebrate Elwha." The U.S. Geological Survey (USGS), which has a long history of Elwha River research and monitoring (see related *Sound Waves* articles at **http://soundwaves.usgs.gov/2006/11/fieldwork3.html** and **http://soundwaves.usgs.gov/2005/02/research.html**), participated in numerous Celebrate Elwha events. Concurrently, several USGS research groups conducted their final "pre-removal" surveys of the conditions of the river, the reservoir sediment, the river-channel morphology, and the coastal setting at the river mouth. The multiagency activities of September 2011 helped to inform colleagues, managers, and the general public about the restoration of the Elwha River, as well as providing the final observations of the river in its dammed state.

(Elwha Dam Removal continued on page 2)



*Olympic Peninsula, Washington, showing Elwha River watershed (orange outline), boundary of Olympic National Park (yellow), and approximate dam sites (black-and-white bars). Modified from figure 1.2 in USGS Scientific Investigations Report 2011-5120 (**http:/pubs.usgs.gov/sir/2011/5120/**).*

*Webcam views of Glines Canyon Dam before (left) and 2½ weeks after (right) removal began. For the latest view, visit **http://www.video-monitoring.com/construction/Olympic/silver.htm**.*

Sound Waves

Editor
Helen Gibbons
Santa Cruz, California
Telephone: (650) 329-5042
E-mail: hgibbons@usgs.gov
Fax: (831) 427-4709

Print Layout Editors
Susan Mayfield, Sara Boore
Menlo Park, California
Telephone: (650) 329-5066
E-mail: smayfiel@usgs.gov; sboore@yahoo.com
Fax: (650) 329-5051

Web Layout Editor
Jolene Gittens
St. Petersburg, Florida
Telephone: (727) 803-8747 Ext. 3038
E-mail: jgittens@usgs.gov
Fax: (727) 803-2032

SOUND WAVES (WITH ADDITIONAL LINKS) IS AVAILABLE ONLINE AT URL
http://soundwaves.usgs.gov/

Contents

Submission Guidelines

Deadline: The deadline for news items and publication lists for the January/February issue of *Sound Waves* is Thursday, December 8.
Publications: When new publications or products are released, please notify the editor with a full reference and a bulleted summary or description.
Images: Please submit all images at publication size (column, 2-column, or page width). Resolution of 200 to 300 dpi (dots per inch) is best. Adobe Illustrator© files or EPS files work well with vector files (such as graphs or diagrams). TIFF and JPEG files work well with raster files (photographs or rasterized vector files).

Any use of trade, firm, or product names is for descriptive purposes only and does not imply endorsement by the U.S. Government.

U.S. Geological Survey
Earth Science Information Sources:

Need to find natural-science data or information? Visit the USGS Frequently Asked Questions (FAQ's) at URL **http://www.usgs.gov/faq/**

Can't find the answer to your question on the Web? Call 1-888-ASK-USGS

Want to e-mail your question to the USGS? Send it to this address: ask@usgs.gov

Fieldwork, continued

(Elwha Dam Removal continued from page 1)

Among the week's activities was a 2½-day Elwha River Science Symposium, led by USGS scientist **Jeff Duda** of the USGS Western Fisheries Research Center (WFRC). The symposium was attended by more than 350 participants and included numerous scientific and multimedia presentations. Keynote speakers included experts in river and salmon restoration and people deeply knowledgeable about the Elwha: **James Karr** (Professor Emeritus in the University of Washington's School of Aquatic and Fishery Sciences), **Thomas Lovejoy** (Professor of Environmental Science and Policy at George Mason University and founder of the Public Television series *Nature*), **Yvon Chouinard** (global conservationist and founder of the outdoor clothing and equipment company Patagonia), **Martin Doyle** (Professor of River Science and Policy at Duke University), **Dick Goin** (resident with 7 decades of experience observing the Elwha River and its salmon populations), **Gordon Grant** (Research Hydrologist at the U.S. Forest Service's Pacific Northwest Research Station and Professor [Courtesy] in the Department of Geosciences at Oregon State University), **David Montgomery** (Professor in the Department of Earth and Space Sciences at the University of Washington), and **Thomas Quinn** (Professor in the School of Aquatic and Fishery Sciences at the University of Washington).

On the first evening of the Elwha River Science Symposium, USGS geologist **Jonathan Warrick** gave a public lecture along with reporter **Lynda Mapes** (*Seattle Times*) and documentary filmmaker and photographer **John Gussman** (Double-click Productions). During the symposium sessions, findings on baseline conditions in the Elwha River watershed and expected outcomes of dam removal were presented by USGS scientists from several centers, including **Amy Draut** (Pacific Coastal and Marine Science Center [PCMSC]), **Guy Gelfenbaum** (PCMSC), **Chris Konrad** (Washington Water Science Center [WWSC]), **Chris Magirl** (WWSC), **Pat Shafroth** (Fort Collins Science Center), **Steve Rubin** (WFRC), and **Jonathan Warrick** (PCMSC). Several other USGS scientists were noted for their early and important work on the Elwha River, including **Mark Munn** (WWSC) and the late **Dallas Childers** (formerly with the USGS Cascades Volcano Observatory). The Elwha River Science Symposium ended with a 3-hour cruise from Port An-

(Elwha Dam Removal continued on page 3)

*Secretary of the Interior **Ken Salazar** speaks at a ceremony on Elwha Dam just before removal begins on September 17, 2011. Photograph by **Guy Gelfenbaum** (USGS).*

*USGS researchers from the multidisciplinary Coastal Habitats in Puget Sound (CHIPS) project at the Elwha Dam removal ceremony, September 17, 2011 (left to right): **Pat Shafroth**, **Jon Warrick**, **Jeff Duda**, **Guy Gelfenbaum**, and **Amy Draut**.*

(Elwha Dam Removal continued from page 2)

geles to the mouth of the Elwha River for 100 attendees. **Jonathan Warrick** and **Ian Miller** (University of California-Santa Cruz and Washington SeaGrant) served as co-emcees, providing interpretations and background information during the cruise.

Perhaps the highlight of the week was the ceremony held on and adjacent to the Elwha Dam on September 17, 2011. Speakers at this event included Secretary of the Interior **Ken Salazar**, Washington Governor **Chris Gregoire**, Lower Elwha Klallam Tribal Chairwoman **Frances Charles**, U.S. Congressman **Norm Dicks**, U.S. Senators **Patty Murray** and **Maria Cantwell**, Assistant Secretary for Indian Affairs **Larry Echo Hawk**, Bureau of Reclamation Commissioner **Michael Connor**, and National Park Service Director **Jon Jarvis**. Music and dance were provided by several groups, including the Klallam Drum and Dance Group. Three USGS scientists—**Jeff Duda**, **Pat Shafroth**, and **Jonathan Warrick**—were among the half-dozen docents who welcomed attendees and provided interpretations for the day's events. The ceremony ended with the removal of part of the Elwha Dam by an excavator with a gold-painted bucket. The excavator tore apart a section of the dam to the sounds of celebration drumming and singing by the Klallam Drum and Dance Group.

*USGS scientists **Amy Draut** (left) and **Josh Logan** set up a ground-based lidar (light detection and ranging) scanner to measure the topography of the lower Elwha River flood plain. Photograph by **Andy Ritchie**, USGS.*

While the week ended with concerts, parties, public hikes into the Elwha River watershed, and storytelling and film events, **Amy Draut**, **Josh Logan** (USGS PCMSC), and **Toby Minear** (USGS, California Water Science Center) finished the final pre-removal surveys of the river channel and reservoir sediment. These surveys will help document how the Elwha River channel changes after dam removal.

The commencement of dam removal begins a 2½-year process of taking down the Glines Canyon and Elwha Dams to help restore the once-vibrant salmon runs on the Elwha River. It also launches a new and important phase of scientific investigation, as researchers seek to describe and understand the changes that will occur to the ecosystems and natural resources of the Elwha River watershed and coast during and after dam removal.

For further information about the Elwha River Restoration Project, visit the following Web sites:

Webcams of the dam sites:
http://www.video-monitoring.com/construction/Olympic/silver.htm
Background information about the Elwha River and its dam removals:
http://www.nps.gov/olym/naturescience/elwha-ecosystem-restoration.htm
http://seattletimes.nwsource.com/flatpages/specialreports/elwha/
USGS research and monitoring of the Elwha River:
http://www.usgs.gov/elwha/
Baseline conditions of the Elwha River before dam removal:
http:/pubs.usgs.gov/sir/2011/5120/

*Webcam views of Elwha Dam before (left) and 2½ weeks after (right) removal began. Flags and celebrants are visible on the bridge over the dam in the before shot, taken the day removal began. For the latest view, visit **http://www.video-monitoring.com/construction/Olympic/silver.htm**.*

Mechanical Arm + Internet = Realtime Profiles of Particles Near the Seafloor

By Chris Sherwood

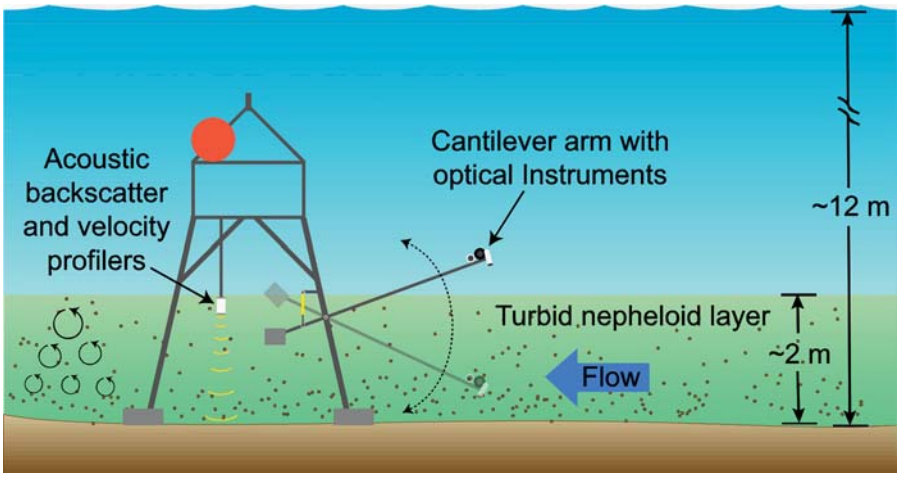
We're not sure what to call it, but it moves, it sees, and it has a brain (of sorts). For a month, it lived 12 m deep about a mile off South Beach on Martha's Vineyard, Massachusetts. And it talked to us, because it was connected to power and Internet supplied by the Martha's Vineyard Coastal Observatory (**http://www.whoi.edu/mvco/**). The talking part was not all good…we liked getting the data and good reports, but because we *could* check in at all hours of the day and night, we felt like we *had* to. Kind of like texting your kids while they're out on a date. We were happy to find that it was well behaved.

"It" is a unique profiling system designed and built by a team of U.S. Geological Survey (USGS) engineers and technicians at the USGS Woods Hole Coastal and Marine Science Center in Woods Hole, Massachusetts. We deployed it to study how particles affect the attenuation of light in the water and to answer questions like: How deep does sunlight penetrate? Does enough light reach the bottom for seagrass or coral to grow? Will our laser bathymetry devices work? How far can a diver see? Can an ROV (remotely operated vehicle) see an oil plume? How much sediment is in the water? Are our sediment-transport models predicting the right amount? Do our optical measurements (based on light) agree with acoustic measurements (based on sound)?

To answer these questions, we needed to make both optical and acoustic measurements in the same place, at the same time.

The profiling system was deployed as part of the OASIS (Optics Acoustics and Stress In Situ) project, funded by the Office of Naval Research, with additional support from the USGS Coastal and Marine Geology Program. The profiler was designed to move a package of optical and acoustic sensors up and down through the 2 m of water just above the seafloor. After much debate, our final design uses a custom-built electric motor to screw a threaded rod through a nut on the end of a cantilevered arm. As the screw turns, the other end of the arm moves from about 2.2 m above the bottom to 0.3 m above the bottom at a rate of 11 to 12 cm per minute. The motor has incredible torque, considering that its power is limited to less than 4 amps at 24 volts, and the arm can easily lift the 50-kg instrument package. It starts profiling on the even hour and takes about 17 minutes to move from the top to the bottom position, where it remains until 20 minutes past the hour.

(Realtime Profiler continued on page 5)



*Schematic illustration of tripod holding acoustic and optical instruments for profiling particle distributions in the bottom boundary layer. The "nepheloid layer" is a region of turbid water commonly present near the bottom. Illustration by **Pat Dickhudt**, USGS.*

***Emmanuel Boss** (University of Maine) cleans the optics on the profiling arm before deployment south of Martha's Vineyard (in background). Some of the instruments visible here are a laser-diffraction particle sizer (labeled "LISST-100X"), CTD (at end of arm, with copper tape to prevent fouling), white acoustic Doppler velocimeter (left of CTD), multiwavelength optical backscatter sensor (being cleaned), 10-cm transmissometer (on top, with some blue antifouling paint), and screened water intake (right of CTD). Cable to an accelerometer hidden behind the CTD is marked with red tape. Photograph by **Dann Blackwood**, USGS.*

(Realtime Profiler continued from page 4)

Then it profiles to the top, waits until 40 minutes past the hour, and repeats another round-trip profile.

The recent deployment, from mid-September through mid-October 2011, was the first time we have had real-time data from sediment-transport instruments connected to a cabled observatory. The project has been managed by **Marinna Martini**, who designed the electronics of the arm-control system, programmed the controller, and oversaw all the other technical activities. **Emile Bergeron** designed (and redesigned) and built (and rebuilt) the mechanical components. He made most of the key parts by hand and specified the Technadyne Industries motor that has been so reliable. **Jonathan Borden** built the tripod, the housing for the electronics, and all the cables, and he runs all the logistics on deck during deployment and recovery. **Ellyn Montgomery** wrote the C programs and Linux scripts that actually control the arm and enable the various computers to communicate, and she modified code from **Sam Laney** of the Woods Hole Oceanographic Institution (WHOI) to make the computers log data in real time. **Pat Dickhudt** heroically managed to get the new holographic particle sizer running reliably and, with the help of **Chris Sabens** and **Brandy Armstrong**, set up most of the instruments on the tripod. Our summer Partnership Education Program (PEP) student **Andy Klein** helped us calibrate the motor speed and arm movement. **Michael Casso**, **Sandy Baldwin**, and **Chuck Worley** made several dives alongside WHOI divers led by **Jay Sisson** to check on the instruments and clean barnacles off the optics.

Optical profiles are difficult to make in the ocean because light is scattered and absorbed by water and particles in the water. Acoustics work much better, but sound and light respond differently to particles. Light responds to the *area* of particles in the water (proportional to the number of particles times the *square* of their diameters). Sound responds to the *volume* of particles in the water (proportional to the number of particles times the *cube* of their diameters). And, because particles can clump together to form aggregates that can later be torn apart by turbulence, the number and size of particles is always changing, even if no new sediment (or dead phytoplankton or other type of particle) is added or removed. In addition, the mass of particles near the bottom is always changing, as material settles from the productive surface layer, is transported from other places by currents, or is resuspended from the bottom by wave action.

***Michael Casso** (left) and **Emmanuel Boss** discuss their dive to deploy the profiling system. Photograph by **Dann Blackwood**, USGS.*

Sound can travel much farther in the ocean than light, and so oceanographers rely on acoustics for many measurements, including profiles of particles. We'd like to be able to use those acoustic measurements to predict how light will behave (and answer the important questions listed at the beginning of this article). To do so, we need to compare the response of light and sound to clouds of particles at the same time, in the same place. From these measurements, physicists would like to be able to relate the scattering and absorption of light and sound to the size, number, and density of the particles. Geologists would like to be able to check our models of near-bed suspended-sediment transport. Ecologists want to know which particles are zooplankton and which are phytoplankton or detritus, and how they affect (or respond to) the amount of light that gets to the bottom. Divers would like to be

(Realtime Profiler continued on page 6)

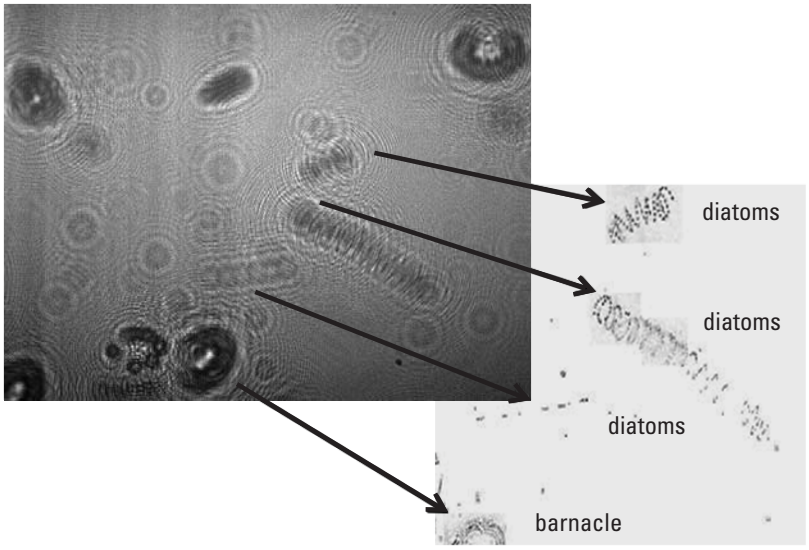
*Divers preparing to plug the profiler into the underwater observatory connection, from left to right: **Jay Sisson** (WHOI), **Michael Casso** (USGS), **Scott McCue** (WHOI), and **Emmanuel Boss** (University of Maine). In yellow hardhats (left to right): **Peter Traykovski** (WHOI), **Pat Dickhudt** (USGS), and* Connecticut *crew member **Aaron Kaufman** (University of Connecticut). Photograph by **Dann Blackwood**, USGS.*

(Realtime Profiler continued from page 5)

able to predict near-bottom visibility from models, or at least from acoustic information. Acoustic profiles and point measurements have become easy to collect, but before we deployed our profiler, no one had made co-located profiles of both optical and acoustic properties in the bottom boundary layer (the part of the water flow that undergoes frictional slowing because of its proximity to the bed).

Our profiler has six optical sensors on the arm, three of which are standard for marine geologists: a 10-cm pathlength transmissometer (to measure how much light from a source is transmitted through the water; see **http://www.whoi.edu/page.do?pid=8415&tid=282&cid=11489**) and two single-wavelength infrared optical backscatter sensors (to measure how much light from a source is reflected back to its sensor by particles suspended in the water; see **http://sfbay.wr.usgs.gov/access/wqdata/overview/measure/calib/Cal_tss.html**). Two other sensors are more sophisticated (but nevertheless commercially available): a multiwavelength backscatter sensor with fluorometer (to measure chlorophyll), deployed by our University of Maine collaborator, **Emmanuel Boss**; and a laser-diffraction particle sizer. The sixth sensor is a prototype of a commercial laser holographic particle sizer. In addition to these optical sensors, we have also mounted on the arm an acoustic Doppler velocimeter (to measure currents and turbulence), an acoustic backscatter profiler, a CTD (conductivity-temperature-depth sensor), a dissolved-oxygen sensor, and an accelerometer (to monitor arm motion). Finally, **Emmanuel Boss** has put a water intake on the end of the arm; a pump on the tripod draws water through this intake and past an optical sensor that measures the amount of light absorbed and scattered at several wavelengths for both unfiltered and filtered (no particles) water. On the main tripod, we have six more optical sensors, four current meters to measure waves and near-bottom currents, and two more CTDs.

We deployed the profiler at the Martha's Vineyard Coastal Observatory on September 17, 2011, from the research vessel *Connecticut*, which has dynamic positioning—a computer-controlled system that uses the vessel's propellers and thrusters to automatically maintain its position and heading. The *Connecticut's* dynamic positioning allowed us to place instruments on the bottom within approximately 3 m of a target. We needed that precision to ensure that our cable would reach the permanent underwater connection maintained as part of the Martha's Vineyard Coastal Observatory and to avoid the nearby instruments placed by our co-principal investigators, **Norm Farr** (WHOI), **Paul Hill** (Dalhousie University), and **Tim Milligan** (Bedford Institute of Oceanography).



Raw image (left) from holographic camera, showing diffraction patterns that look like ripples around particles in field of view. Preliminary processing of this image (right) reveals both straight and spring-shaped diatom chains, foraminifers, barnacles (growing on the lenses), and sediment particles. (The spring-shaped diatom chains might be Chaetoceros *sp.; for example, see* ***http://www.smhi.se/oceanografi/oce_info_data/plankton_checklist/diatoms/chaetoceros_curvisetus.htm****).*

Most of the instruments store data autonomously, and so we did not see the full dataset until after recovery of the profiling system on October 23, 2011. Three days before recovery, on Thursday, October 20, gale-force winds pummeled the Martha's Vineyard Coastal Observatory. We don't yet know how high the waves were because the observatory's wave gage had failed several days before. Sometime in the dark of Thursday night, the profiler's arm failed. As best we can reconstruct it, two failures took place—first, the coupling between the arm and the motor broke, and later the tripod was actually knocked over. On Sunday, October 23, we recovered everything under beautiful fall skies and on flat calm seas. Four of the optical sensors were broken, but all the data loggers apparently continued to work through the storm, and all the measurements were recovered.

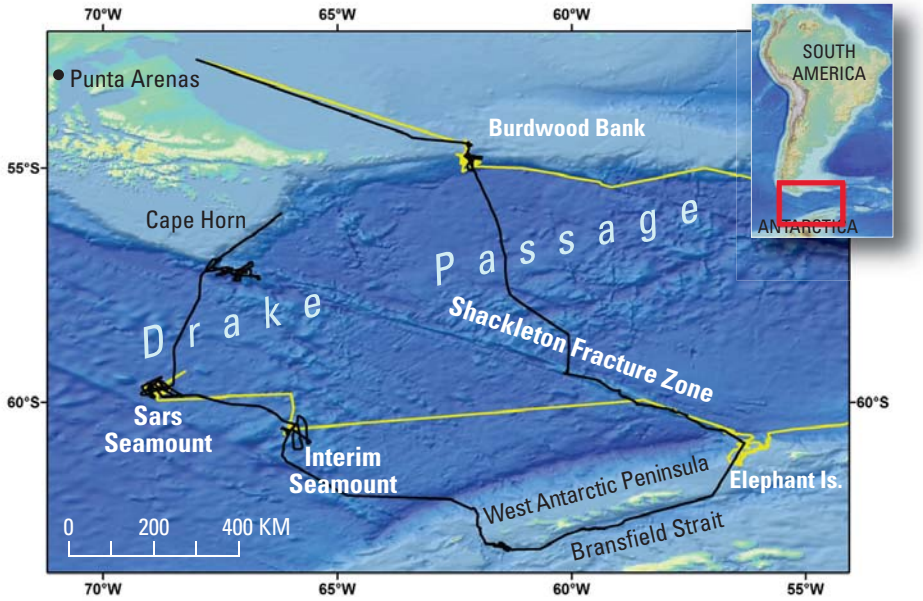
We are currently analyzing these data, and what we have seen so far is exciting. Even before recovery, we were transferring about 1,600 images per day from the holographic camera and logging profiles of turbidity from one of the optical sensors. The turbidity profiles exhibit various shapes in response to upward mixing and downward settling of particles. By combining the images and turbidity profiles with the acoustic profiles and our measurements of bottom currents and stratification, we will be able to critically evaluate our models of resuspension and particle aggregation in the coastal ocean. These results, in turn, can be used in models for predicting coastal erosion, forecasting underwater visibility, modeling ecosystems, evaluating bottom habitats, studying transport of pollutants, and siting renewable-energy projects.

Climate History and Deep-Sea-Coral Habitats—Clues from the Drake Passage Between Antarctica and South America

By Kathy Scanlon

In May and June 2011, U.S. Geological Survey (USGS) marine geologist **Kathy Scanlon** participated in a 34-day research cruise on the icebreaking research vessel *Nathaniel B. Palmer* in the Drake Passage between Antarctica and South America. This was the second and final cruise of a project begun in 2008 (see article in *Sound Waves*, August 2008, at **http://soundwaves.usgs.gov/2008/08/**) with geochemist **Laura Robinson** of the Woods Hole Oceanographic Institution (WHOI) and the University of Bristol, U.K., and biologist **Rhian Waller** of the University of Maine.

Also participating in the cruise was **Shannon Hoy**, an undergraduate at the College of Charleston, who was funded by the CARIS software company to help with the acquisition and processing of multibeam bathymetric (seafloor depth) data. **Hoy** received special training from CARIS before the cruise. After the cruise, she continued to work with **Scanlon** on the multibeam bathymetric data as a guest student at the WHOI and USGS offices in Woods Hole, Massachusetts.



Study area in the Drake Passage (red box on index map), showing ship's tracklines for 2008 (yellow) and 2011 (black).

The main objectives of the cruise were (1) to use a multibeam sonar system to complete bathymetric mapping of areas partly mapped in 2008 and to map new areas of the Drake Passage; (2) to identify present and past distributions of deep-sea corals by taking digital photographic images of the seafloor and collecting live and fossil specimens (a scientific paper analyzing the distributions revealed in our 2008 data was published January 2011 in *PLoS ONE*, at **http://dx.doi.org/10.1371/journal.pone.0016153**); and (3) to collect fossil cold-water coral skeletons, which are useful as archives of oceanographic history. Corals build their skeletons out of ingredients in seawater and thus record the distinctive chemistry of the water masses in which they grow. Using uranium-series dating techniques and radiocarbon analyses of our fossil specimens, we can reconstruct radiocarbon profiles of seawater masses over time for the past approximately 40,000 years.

(Drake Passage continued on page 8)

◄ ***Kathy Scanlon**, geologist with the USGS Woods Hole Coastal and Marine Science Center (right), and **Andrea Burke**, graduate student in the WHOI/MIT Joint Program, kneel on the deck of the research vessel **Nathaniel B. Palmer** to sort through the contents of a dredge, looking for ancient coral skeletons among the rocks. Photograph by **Marshall Swartz**, WHOI.*

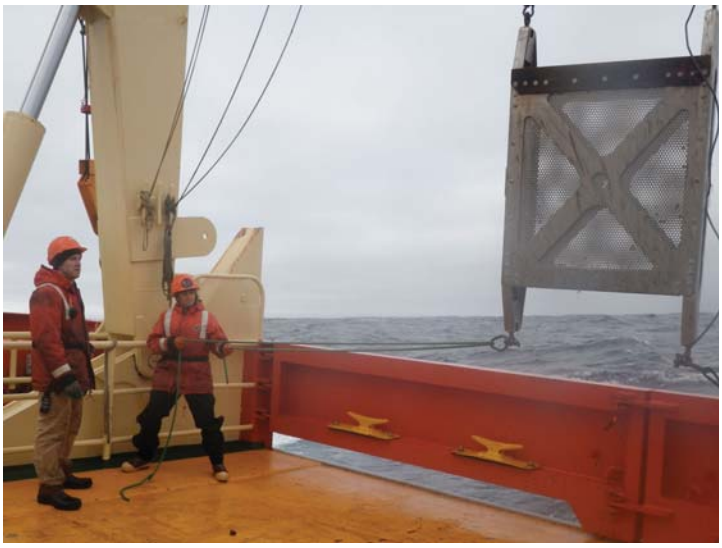
The icebreaking research vessel Nathaniel B. Palmer *rests at the dock in Punta Arenas, Chile. The U.S. Antarctic Program (**http://www.usap.gov/**) contracts the* Palmer *to support National Science Foundation-funded research in the Southern Ocean. Photograph by **Shannon Hoy**, College of Charleston.*

(Drake Passage continued from page 7)

The cruise was highly successful. Little time was lost due to weather conditions, which can be extremely harsh in the Southern Ocean during the late fall to early winter. We collected more than 14,000 fossil solitary scleractinian (stony coral) skeletons, 4,210 trackline-kilometers of multibeam bathymetric data, and more than 20,000 seafloor photographs, as well as several sediment cores, thousands of biological specimens, and water samples from each of six CTD (conductivity-temperature-depth) deployments.

The coral, water, and sediment samples, together with those collected in 2008, will enable us to put new constraints on the past extent of air-sea gas exchange, polar water-column stratification, and flux of Southern Ocean-sourced deep water to the rest of the world's oceans. Data from this cruise will allow the first systematic study of these constraints and of the environmental controls on deep-water coral biogeography in the Drake Passage, as well as enable us to test hypotheses linking processes in the Southern Ocean to climate change.

To read a daily educational blog maintained during the cruise, visit **http://antarcticcorals.blogspot.com/**.



Shannon Hoy *(right), a student at the College of Charleston, assists during deployment of a dredge under the watchful eye of* ***Stian Alesandrini*** *(Raytheon Polar Services), the mechanical technician in charge of deck operations.*

Common Murre Chicks Hatch for the First Time in 100 Years on the Channel Islands off Southern California

By Josh Adams and Jon Felis

Last July, researchers from the U.S. Geological Survey (USGS) and the National Park Service (NPS) discovered that California Common Murre (*Uria aalge californica*) chicks had hatched on the Channel Islands for the first time since 1912.

The murre (pronounced "mrr," after the bird's characteristic vocalizations) is a football-size seabird of the auk family (Alcidae) that resembles certain black-and-white, tuxedo-clad penguins. Like penguins, murres use their wings to "fly" deep underwater, but unlike penguins, they also fly in the air. Historically, murres nested on Prince Island, a small islet off San Miguel Island within Channel Islands National Park. This colony disappeared nearly a century ago, likely as a result of human disturbance and egg harvesting.

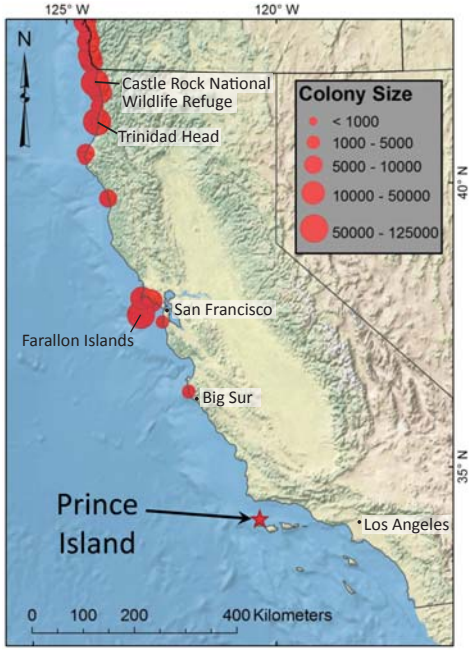
In California, Common Murres are most abundant off central through northern California, with tens to hundreds of thousands of birds nesting at the Farallon Islands, off Trinidad Head, and at Castle Rock National Wildlife Refuge (see map). Smaller colonies occur farther south, on nearshore islets along the Big Sur coast and, now, on Prince Island.

"This is an exciting finding—certainly a historic one," said **Josh Adams**, a seabird ecologist with the USGS Western Ecological Research Center (**http://www.werc.usgs.gov/person.aspx?personID=240**). "The murres appear to have reestablished their former southern range, perhaps benefitting from present ocean conditions."

The new colony is perched on 100-ft-high sea cliffs and was spotted by **Adams**, USGS biologist **Jonathan Felis**, and their Channel Islands National Park colleagues **Laurie Harvey** and **David Mazurkeiwicz** during research trips to this remote windswept island last summer.

Researchers **Adams** and **Felis** used boat-based telephoto images to document the murre colony and count its members on June 14 and 28 and July 12, 2011. During these three counts, total numbers of murres were consistent, between 125 and 129 individuals. Numbers of sitting murres

(Murre Chicks continued on page 9)



California Common Murre breeding colonies. After murres were extirpated from Prince Island (red star) by 1912, the most southerly murre breeding colony was near Big Sur. Red circles scaled to approximate colony size, after ***Arthur L. Sowls*** *and others'* Catalog of California Seabird Colonies, *published 1980 by the U.S. Fish and Wildlife Service (available online at* ***http://www.archive.org/details/catalogofcalifor00coasrich****).*

(Murre Chicks continued from page 8)

holding sites and in "incubating posture" also were consistent in the three counts, at 89, 88, and 79. Photographs taken July 12 reveal a single broken eggshell amidst several adults holding fish in their mouths; one adult appears to be delivering a fish to a young nestling.

NPS biologist **Harvey** and murre biologist **Mike Parker** later observed several well-developed chicks on July 28, 2011.

For the first 2 weeks of their life, murre chicks are fed at the colony by their parents, which forage within about 50 km (30 mi) of their colonies and seek out abundant shoaling fishes, such as juvenile rockfishes, anchovies, and sardines. Using their wings to propel themselves underwater to depths of more than 150 m (490 ft), parents capture one fish at a time to feed the chicks. At about half the size of the parents and still unable to fly, 2-week-old murre chicks waddle off the cliff edges to the surf below. They join their fathers, which raise the chicks at sea until they are capable of diving and feeding on their own.

With this murre colony, Prince Island now hosts 13 nesting seabird species, making it one of the most important and biologically diverse nesting habitats on the west coast of North America.

Adams noted that the murres' recolonization of Prince Island "comes at an interesting time oceanographically, as conditions in the Santa Barbara Channel have been exceptionally productive during the past decade. Although many factors affect population redistribution and recovery, no doubt the murres at Prince Island are benefiting from relatively cool summertime waters, increased ocean productivity, and changes in forage-fish availability."

The California Common Murre is protected under the Migratory Bird Treaty Act (**http://www.fws.gov/migratorybirds/RegulationsPolicies/treatlaw.html**), and the reestablished colony is afforded further protection by being situated in Channel Islands National Park (**http://www.nps.gov/chis/**), Channel Islands National Marine Sanctuary (**http://channelislands.noaa.gov/**), and the recently designated Harris Point California Marine Protected Area.

*A breeding colony of California Common Murres (*Uria aalge californica*) on Prince Island of San Miguel Island off southern California, photographed July 12, 2011. Ecologists **Josh Adams** and **Jonathan Felis** of the USGS Western Ecological Research Center shot this and other high-resolution digital telephotos from a research vessel and used the photographs to identify nesting and feeding behavior. The photographs provide evidence of the first California Common Murre breeding colony in the Channel Islands in 100 years. Red box shows area enlarged in photograph below.*

Enlarged excerpt from photograph above, showing evidence of nesting and chick-feeding in the California Common Murre colony on Prince Island. Left red circle highlights an adult murre holding a fish in its bill; center circle highlights a murre egg fragment, with yellowish interior of eggshell visible; right circle highlights another adult murre also holding a fish, possibly attempting to feed prey to a chick.

Seabird biologists will continue to evaluate the future of the Common Murre colony at Prince Island. Partners in this monitoring effort include the Montrose Settlements Restoration Program (**http://www.darrp.noaa.gov/southwest/montrose/msrphome.html**) and the California Institute for Environmental Studies.

More information on California seabird research is posted on the USGS Western Ecological Research Center's seabird-research Web site at **http://www.werc.usgs.gov/project.aspx?projectid=201**. More information about the Common Murre is available in a report published by the USGS in cooperation with the U.S. Fish and Wildlife Service that can be downloaded from **http://www.archive.org/details/biologyconservat01geolrich**.

Pacific Walruses Studied as Sea Ice Melts

By Paul Laustsen

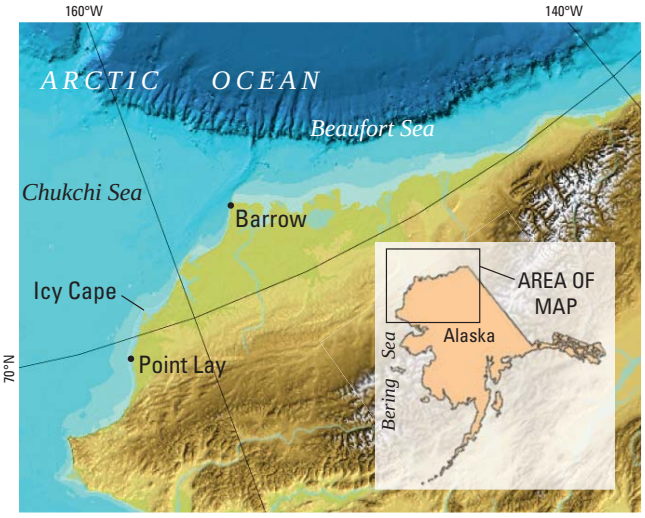
U.S. Geological Survey (USGS) Alaska Science Center researchers, in cooperation with the Native Village of Point Lay, Alaska, attached 74 satellite radio tags to Pacific walruses last summer as part of their ongoing study of how the animals are responding to reduced sea-ice conditions in late summer and fall. (To view tracking animations of the tagged walruses' movements, updated approximately every week, visit **http://alaska.usgs.gov/science/biology/walrus/2011animation_Norseman.html**.)

Walruses spend most of their lives at sea, diving hundreds of feet to forage on the seafloor. Typically, they haul out on sea ice to rest between feeding bouts, but when the sea ice recedes past the continental shelf into very deep waters of the Arctic Basin, the walruses haul out on land. The extent of sea ice has been less in recent summers, and walruses have been hauling out on beaches in Alaska and Russia in the past few years.

Since 2004, the USGS Alaska Science Center Pacific Walrus Research Program (**http://alaska.usgs.gov/science/biology/walrus/**) has collected data on walrus foraging behavior and movements throughout areas of the Bering and Chukchi Seas, both when sea ice is present and when it is absent over the continental shelf. Female walruses and their young have come ashore during late summer and fall in 4 of the past 5 years on Alaska's northwest coast. In 2010 and again in 2011, thousands of walruses gathered on beaches north of Point Lay. In 2010, walruses came ashore in late August. In 2011, the sea ice disappeared from the shelf earlier and walruses were coming ashore by mid-August.

"Sea ice is an important component in the life cycle of walruses," said **Chad Jay**, research ecologist with the USGS Alaska Science Center. "These tracking studies will help us to better understand how top consumers in the Arctic ecosystem may be affected by changes in sea-ice habitats."

In July 2011, scientists attached 40 radio tags on walruses hauled out on distant offshore sea ice near the edge of the continental shelf, northwest of Barrow, Alaska. In late August, they tagged 34 walruses that had hauled out on the coast of northwestern Alaska after retreat of sea ice from the shelf.



*North coast of Alaska and offshore seafloor, showing deep Arctic Ocean seafloor (dark blue) and continental shelf (aqua blue). In 2010 and again in 2011, thousands of walruses gathered on beaches north of Point Lay after sea ice had receded from the continental shelf. To view high-resolution video of Pacific walruses hauling out near Point Lay in late August 2011, visit **http://gallery.usgs.gov/videos/445**.*

With increased awareness of the walrus haulouts comes the need for protecting the resting animals from human disturbance. Walruses face danger from stampedes when they gather on shore. For example, more than 130 mostly young walruses were crushed in September 2009 at Alaska's Icy Cape from a disturbance of unknown cause. The U.S. Fish and Wildlife Service, the Eskimo Walrus Commission, the North Slope Borough, and the Native Villages of Barrow and Point Lay are working with lo-

(Pacific Walrus continued on page 11)

*Walrus female and pup on an ice floe in the Chukchi Sea, photographed by **Sarah Sonsthagen** (USGS) on June 12, 2010, during a tagging survey aboard the research vessel* Norseman II.

(Pacific Walrus continued from page 10)

cal hunters, pilots, operators of marine vessels, and the public to distribute guidelines that will protect the herds.

In April 2011, Point Lay received an "Outstanding Partner" Award from the U.S. Fish and Wildlife Service Alaska Region for its work to protect walruses in September 2010, when tens of thousands of migrating walruses hauled out on the Chukchi Sea barrier beach within sight of the small Inupiaq community. Point Lay once more took the initiative in late August 2011, when the walruses again hauled out nearby. Community leaders took an Incident Command System approach (**http://www.fema.gov/emergency/nims/IncidentCommandSystem.shtm**) to protecting the walruses. They issued a news release and walrus photographs to reporters but also requested that media crews not travel to Point Lay. When media did arrive, the leaders participated in interviews and advised visitors on how to get the stories they needed without disturbing the animals. Thus continued Point Lay's long tradition of collaboration with science while showing respect for the thousands of weary animals resting nearby.

To view high-resolution video of Pacific walruses hauling out near Point Lay in late August 2011, visit **http://gallery.usgs.gov/videos/445**. An information sheet about the ongoing walrus studies, titled "The Science Behind the 2011 Walrus Haulout FAQ," is posted at **http://alaska.usgs.gov/science/biology/walrus/**. For additional photographs and information related to USGS Pacific walrus studies, visit **http://www.usgs.gov/blogs/features/2011/08/16/walruses-and-arctic-sea-ice-retreat/**.

***Tony Fischbach** (USGS) on the beach with a tagged walrus near Point Lay, Alaska, on September 1, 2010. Walruses gathered on Alaskan shores of the Chukchi Sea by the tens of thousands in late August and September 2010 after the last of the sea ice dissipated.*

Science in Support of Everglades Restoration—Some Contributions from the USGS in Florida

By Matt Cimitile

Today's Everglades may still seem vast and wild, but more than a century of dredging, canal and levee building, agriculture, and other human activities in the region has greatly undermined the ecological functions of the largest subtropical wilderness area in the United States. To reverse this trend, the Comprehensive Everglades Restoration Plan (CERP; **http://www.evergladesplan.org/**) was signed into law by **President Bill Clinton** in 2000. The plan outlines initial ecosystem-wide steps to restore the Everglades back to as natural a state as possible. Of primary importance is restoring natural freshwater flows. "To do so requires water managers to figure out the correct quantity, quality, timing, and distribution of freshwater that persisted before major landscape changes, in order to maintain a healthy and productive ecosystem today," said U.S. Geological Survey (USGS) biologist **Barry Rosen**. The USGS is a crucial partner in providing information and data toward this effort.

By the early 1900s, South Florida was becoming a prime destination for settlers. The region was an expanse of freshwater that farmers and settlers wanted to transform into farmable land. Canal-dredging projects drained water out of the Everglades (known as the River of Grass) and changed wetlands into land ready to be developed and farmed. As land opened up for such crops as sugar cane, tomatoes, beans, and potatoes, more settlers were attracted to the area, leading to further drainage. By 1927, 440 miles of canals, 47 miles of levees, and 16 locks and dams had been constructed throughout the region, according to CERP.

The hurricane of 1928 accelerated changes in the Everglades. The storm's landfall resulted in massive flooding, saltwater intrusion, and thousands of deaths. Calls for federal assistance were immediate and prompted future projects that removed

(Everglades Restoration continued on page 12)

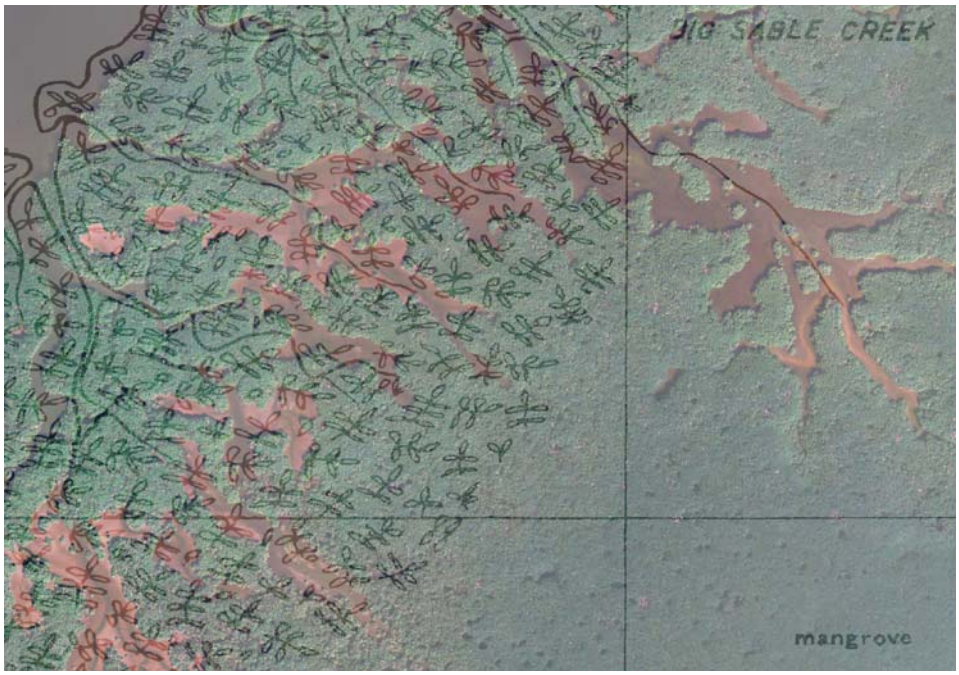
(Everglades Restoration continued from page 11)

more water from the Everglades and built additional flood-protection structures to prevent such destruction from happening again. The Everglades as it had existed for centuries was drastically altered. The River of Grass would eventually shrink to half the size it was at the beginning of the century, according to the Southwest Florida Water Management District.

At about the same time, a grassroots effort developed into a political movement to protect what remained of the natural environment in South Florida. In 1934, Congress authorized creation of a national park in the Everglades, and in 1947, Everglades National Park was established "to conserve the natural landscape and prevent further degradation of its land, plants, and animals" (**http://www.nps.gov/ever/historyculture/**). But the infrastructure that was draining and channeling the region's wetlands by altering freshwater flow had already set in motion a series of disturbances that continue to affect the park's ecosystem today.

To begin restoration of the Everglades, scientists must first piece together the region's natural conditions before drainage. A USGS database of historical maps, charts, and aerial photographs has given scientists a glimpse of the changes that have taken place over the past century and a half. The database contains charts and maps that document explorations into the region from the mid- to late-19th century. Aerial photographs date back to a U.S. Army Air Corps survey of the region in 1928. Additional surveys took place in 1940, 1952, and 1964. All such maps and surveys are electronically scanned into the database, and through a process known as georeferencing, researchers pinpoint precise locations among each map, chart, and aerial photograph through the years.

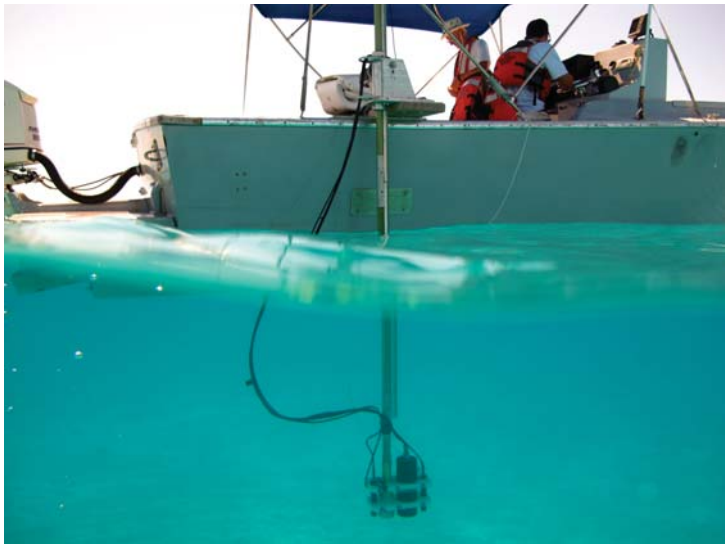
Georeferencing allows researchers to see gradual and, in some cases, sudden changes to the landscape. One clue comes in the form of ecotones, boundaries between two ecological systems. By tracing shifts in ecotones, scientists can view landscape change in terms of ecology. "Using these photos and maps and charts, we can pinpoint where alterations took place and separate out the human signals from the natural signals to determine why these systems changed," said USGS ecologist **Tom Smith** of the Southeast Ecological Science Center in Gainesville, Florida.



*A 1928 topographic sheet overlaid on part of a 2004 color digital orthophoto quadrangle of Big Sable Creek in Everglades National Park. These georeferenced images show areas that were once mangroves and are now mudflats (reddish tan in orthophoto quadrangle). Image courtesy of **Tom Smith**, USGS.*

Along with deciphering changes to ecotones, scientists must also look for clues that reveal what the water conditions were like a century ago. Coral heads are long lived and record seawater conditions as they grow; thus, they can be used to calibrate reconstructions of past salinity and temperature. In September 2009, USGS scientists investigated a section of Florida Bay for the coral species *Solenastrea bournoni*, which is found in shallow turbid environments. *Solenastrea bournoni* is the only coral species that can tolerate the large temperature and salinity swings that frequently occur in Florida Bay. Finding a large coral head would provide proxy data to combine with other historical data to better estimate past temperature and salinity.

(Everglades Restoration continued on page 13)



*The Along-Track Reef-Imaging System (ATRIS), deployed from an adjustable pole mounted to the side of a boat, can provide scientists with information about the condition and type of seafloor. Photograph by **Christina Kellogg**, USGS.*

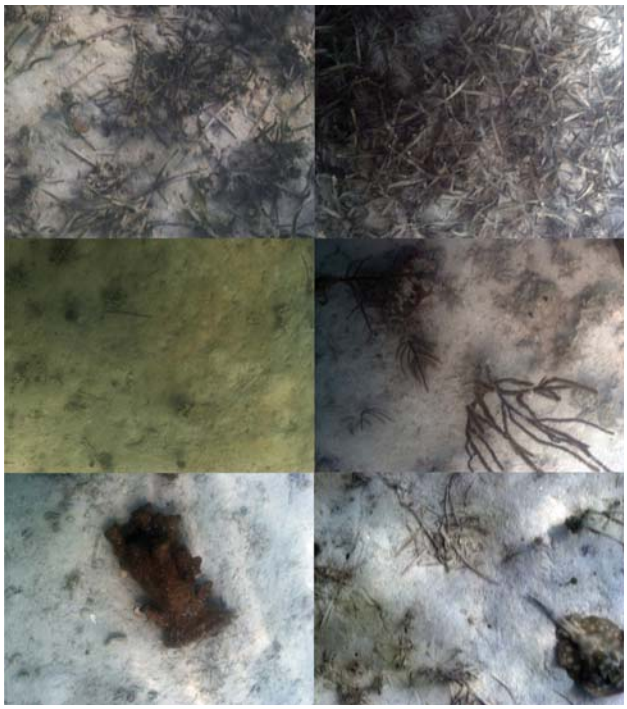
(Everglades Restoration continued from page 12)

"We are trying to understand historical sea-surface temperatures through the use of strontium/calcium ratios in the skeletal material of the corals," said USGS geologist **Chris Reich** of the St. Petersburg Coastal and Marine Science Center in St. Petersburg, Florida. "If we find a big enough coral head, we can see back 100 to 150 years and pick out the salinity swings that occurred in Florida Bay before any of the canals and other modifications in the Everglades took place."

Using a noninvasive observing system called the Along-Track Reef-Imaging System (ATRIS; **http://ngom.usgs.gov/dsp/tech/atris/**), USGS scientists acquired georeferenced, color digital images and water-depth measurements. They collected more than 360,000 images. Although no large coral head was discovered during the fieldwork for use in a calibration study, **Reich** hopes the study will spur further opportunities. "With the interest in this study, we are hoping other opportunities will come up to use the ATRIS system as a tool for looking for additional coral heads or for observing seagrass restoration or storm impacts on restoration initiatives."

While restoration motivates researchers to look to the past, concerns about climate change cause them to look forward. One project is trying to better understand the likely response of vegetated shorelines to predicted sea-level rise. **Smith's** team of scientists, including **Paul Nelson**, **Ginger Range**, **Karen Balentine**, and **Gordon Anderson**, monitor mangrove and marsh vegetation plots throughout the year. Year-round sampling of upstream freshwater sites, brackish sites, and coastal mangrove sites allows for measurements of mangrove forest growth and production in relation to various hydrologic conditions, such as dry versus wet season. The group also measures rates of elevation change in sediment surfaces, as well as soil accretion or loss on the shoreline where coastal mangrove forests and brackish marshes occur. The resulting data allow the team to determine rates and patterns of local sea-level and sediment fluctuations over time scales ranging from less than a year to a decade and longer.

"We are trying to answer—if predictions of sea-level rise follow expected rates—'Can mangrove forests keep up?'" said **Nelson**. "The mangrove shoreline will migrate inland, in which case mangroves die off and sea-level rise is winning; or the mangroves will migrate upward, or vertically, and thus the shoreline remains relatively stable; or they will move seaward if more sediment becomes available."



Collage of photographs taken by the Along-Track Reef-Imaging System (ATRIS), showing various benthic-habitat types in Florida Bay.

Another project, known as "La Florida" (Land of Flowers), looks toward the years 2040-70 to project what might happen to two of Florida's charismatic watersheds, the lower Suwannee River basin and the Everglades, if climate-change predictions hold true. A collaborative effort among the USGS, the University of Florida, and Florida State University, La Florida (**http://fl.biology.usgs.gov/climate/la_florida.html**) is scaling down global-climate models to a resolution that allows researchers to ask detailed questions about future changes in regional weather patterns. Data such as yearly rainfall are integrated with inputs from various ecological and hydrological models to forecast changes to the Everglades ecosystem. By estimating potential future evapotranspiration rates and vegetative responses, researchers can begin to infer how habitat changes may in turn cause shifts in wildlife ranges. The project seeks to understand what will happen to rain patterns under different climate-change scenarios and whether populations of certain species will increase or decrease.

"We decided on projecting to 2040-70 because we wanted the information to be useful to resource managers in our lifetime," said **Smith**.

There are more USGS projects in the Everglades pertaining to hydrology, ecosystem studies, invasive species, and climate change than can be mentioned here. Fortunately, the USGS Greater Everglades Priority Ecosystems Science (PES) has helped organize this flood of data in an information-management system known as SOFIA (**http://sofia.usgs.gov/**). Short for "South Florida Information Access," SOFIA includes an extensive publication database and a diverse collection of data and metadata; it contains information on approximately 200 projects, including past projects and those currently being conducted in South Florida.

"SOFIA is where scientists and the public can access Everglades data and information in one place," said USGS information technology specialist **Heather Henkel**, who maintains the SOFIA system at the St. Petersburg Coastal and Marine Science Center. "It is designed to ensure

(Everglades Restoration continued on page 14)

(Everglades Restoration continued from page 13)

that data resources are carefully managed and that the results from the various studies are archived after projects have ended."

Another platform that stores a wealth of information and supports biological and ecological assessments in the Everglades is the Everglades Depth Estimation Network (EDEN). The EDEN project, managed by **Pamela Telis** of the USGS Florida Water Science Center, brings together real-time water-level, ground-elevation, and water-surface modeling to provide scientists and managers with current water-depth information for the entire freshwater part of the Greater Everglades. Information is integrated and then presented on a 400-m^2 grid that provides a consistent and documented dataset. (For more information, read "EDEN—A Paradise for Water Managers?" in *Sound Waves*, March 2008, **http://soundwaves.usgs.gov/2008/03/pubs.html**, and visit **http://sofia.usgs.gov/eden/**.)

Scientists and managers can use both SOFIA and EDEN to help guide field operations, integrate data about hydrologic and ecological responses, and support assessments that measure ecosystem responses to restoration implementation.

The data accumulated from all these projects provide the baseline information that resource managers will need to guide restoration efforts and to evaluate performance after various restoration steps are completed. "It was essential to have the foundational data gathering and work before we began to construct the CERP components," said **Rosen**. After a decade of conducting research and developing guidelines and regulations pertaining to restoration efforts, Everglades restoration has begun.

*With materials in place to rebuild the hydrology platform (upper right), **Karen Balentine** begins measuring sediment elevation with a sediment elevation table (SET). Sites are measured quarterly in various habitats, including riverine mangrove forests, coastal mangrove mudflats, coastal prairie, and coastal marsh (pictured here). Photograph by **Paul Nelson**, USGS.*

USGS Scientist Honored with Prestigious Federal Employee of the Year Medal for Role in Ending Deepwater Horizon Oil Spill

U.S. Geological Survey (USGS) research hydrologist **Paul Hsieh** was awarded the 2011 Federal Employee of the Year Medal for providing critical scientific information during the Deepwater Horizon oil spill. **Hsieh's** calculations were key in helping senior federal officials and scientists conclude that the containment cap on the ruptured well was working and did not need to be removed, thus ensuring that no additional oil leaked into the Gulf of Mexico.

"**Dr. Hsieh's** swift work and creative thinking was critical to the successful kill of the Macondo well," said Secretary of the Interior **Ken Salazar**, who presented **Hsieh** with the award during a ceremony on September 15, 2011. "**Paul's** brilliance and determination in the face of a national crisis are to be commended, and I present this award on behalf of a grateful nation. In recognizing **Paul**, we also commend the thousands of scientists, public servants, citizens, and volunteers who worked around the clock to protect the Gulf of Mexico and cap the Macondo well."

The Federal Employee of the Year Medal is presented by the nonprofit Partnership for Public Service and recognizes annually a federal employee whose professional contributions exemplify the highest attributes of public service. Celebrating their 10th

(Deepwater Award continued on page 15)

***Paul Hsieh** (center), his wife **Christine Peterson** (left), and USGS Director **Marcia McNutt** (right) at the Service to America Medals gala where **Hsieh** was honored as 2011 Federal Employee of the Year by the Partnership for Public Service.*

(Deepwater Award continued from page 14)

anniversary, the Samuel J. Heyman Service to America Medals (a.k.a. Sammies; see **http://servicetoamericamedals.org/SAM/**) have earned a reputation as one of the most prestigious awards dedicated to honoring America's civil servants.

"It is a real thrill to receive this type of recognition," said **Hsieh**, who emigrated from Hong Kong in 1968 when he was 14 years old. "It has always been my goal to be a public servant for the United States government. Earning this award convinces me that I've really made a contribution to the country that has adopted me as a citizen."

"**Dr. Hsieh** is well known for his ability to bring facts and observations to bear in an innovative and physically insightful way in solving complex scientific challenges," said USGS Director **Marcia McNutt**, who asked **Hsieh** to make the important calculation regarding pressure building at the well. "His mastery of hydrologic analyses and his ability to 'speak from the facts' in a clear and convincing manner were instrumental in guiding the thinking of key decision makers during the Gulf of Mexico well blowout."

Fireboat response crews battle blazing remnants of the Deepwater Horizon offshore oil rig on April 21, 2010. The well would leak an estimated 4.9 million barrels of oil before being successfully stopped. Photograph courtesy of the U.S. Coast Guard.

During the Deepwater Horizon oil spill, **Hsieh** was one of hundreds of government and industry scientists and workers who worked to analyze, manage and, ultimately, end the oil spill. **Hsieh**, who lives in Menlo Park, California, had been in Houston, studying the pressure of the well. Every 6 to 12 hours, he prepared an analysis and defended its scientific validity.

After a 75-ton containment cap was placed on the well in July 2010, new concerns arose that the cap could cause a rupture and worsen the spill. **Hsieh** was back in California when he received a cellphone photo from a USGS colleague of a computer screen showing pressure readings on the well's cap. From that little picture, **Hsieh** labored through the night to evaluate the integrity of the well.

"I knew I had only one chance to get the calculations right," recalled **Hsieh**, who spent the entire night analyzing the data and modifying the model, which had originally been designed to model the behavior of water, not oil. "As a scientist, we are not trained to follow our gut instinct. We have to follow the data, and we did not have much time to make decisions, seek feedback from colleagues, or follow the normal course of action."

On the basis of **Hsieh's** evaluation, and following expert consultations and corroboration with additional evidence in Houston, the government recommendation on the morning of July 16, 2010, was that the Macondo well be allowed to remain shut in and stop leaking oil into the Gulf of Mexico.

Hseih has had a distinguished 33-year career at the USGS. He has made many contributions to the scientific literature pertaining to fluid flow and rock deformation, field hydrological techniques, and analytical and numerical models of groundwater flow and contaminant transport through fractured rock. Chief among **Hsieh's** recent accomplishments is the development of a suite of graphical software packages to facilitate interpretation of model results. These public-domain tools have considerably advanced the degree to which geologists worldwide can gain insight from their simulations and effectively communicate results. **Hsieh's** contributions have been recognized by numerous awards, including the Department of the Interior (DOI) Superior Service Award in 1990, the DOI Meritorious Service Award in 2000, and the DOI Distinguished Service Award in 2008. He was elected a Fellow of the Geological Society of America in 2005 and has twice been cited for outstanding scientific refereeing by the American Geophysical Union, in 1993 and 2005.

To learn more about **Hsieh's** role in determining whether the containment cap on the Macondo well would hold, and to view video interviews with **Hsieh**,visit **http://www.usgs.gov/blogs/features/usgs_top_story/paul-hsieh-named-2011-federal-employee-of-the-year/** and **http://servicetoamericamedals.org/SAM/recipients/profiles/fym11_hsieh.shtml**.

Dick Poore Is New Director of the St. Petersburg Coastal and Marine Science Center

*In August 2011, **Jess D. Weaver**, Regional Executive in the U.S. Geological Survey (USGS) Southeast Area Office, sent the following email message to announce the selection of **Dick Poore** as the new Director of the USGS St. Petersburg Coastal and Marine Science Center in St. Petersburg, Florida.*

I would like to announce a change in leadership at the St. Petersburg Coastal and Marine Science Center (SPCMSC), effective August 24, 2011.

Jack Kindinger has decided to step aside as the Center Director and return to his former position as an oceanographer working in the northern Gulf of Mexico. **Jack** has been the St. Pete Center Director since October of 2009 and was the lead for geology programs in the former Florida Integrated Science Center for several years. **Jack** wants to get back to active research, get to the field more, and leave the management world to someone else. I would like to thank **Jack** for his leadership of the SPCMSC and wish him well as he starts on this next phase of his career. I appreciate his insights and contributions to the Southeast Area.

I have asked **Richard (Dick) Poore** to be the new Center Director, and he has graciously agreed to take on the responsibility. **Dick** has been a Research Geologist since 1974 and is currently the Chief for the Northern Gulf of Mexico Climate and Environmental History Project and the Coral Reef Ecosystem Studies Project. His previous management assignments include Deputy Chief of the Office of Regional Geology (1981-84), Chief of the Branch of Paleontology and Stratigraphy (1984-89), Chief Scientist for the Global Change and Climate History Team (1995-97), and National Science Foundation Marine Geology and Geophysics Program Manager (2000-03). His scientific and management experience will be a great addition to the Southeast Area. I look forward to working with **Dick** as the Center Director and appreciate his willingness to take on the position.

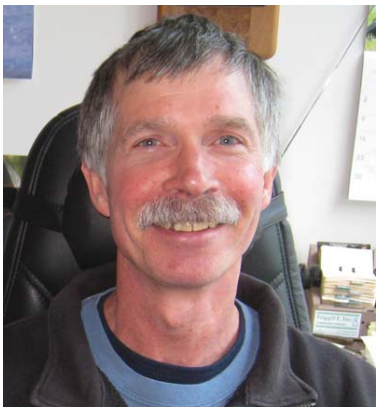
Bob Rosenbauer Is New Director of the Pacific Coastal and Marine Science Center

*On September 26, 2011, **Richard Ferrero**, Associate Regional Executive in the U.S. Geological Survey (USGS) Southwest Area Office, sent the following email message to announce the selection of **Bob Rosenbauer** as the new Director of the USGS Pacific Coastal and Marine Science Center (PCMSC) in Santa Cruz, California.*

I am very pleased to announce the selection of **Bob Rosenbauer** as the new PCMSC Director. **Bob** will transition from his Acting Center Director role to the permanent position, effective immediately. Please join me in providing best wishes and support for **Bob** as we welcome him into this critical leadership responsibility.

Robert "Bob" Rosenbauer is a geochemist who joined the PCMSC of the USGS in Menlo Park, California, in 1974, then known as the Branch of Pacific and Arctic Marine Geology. He soon established the USGS rock/water/gas interaction laboratory and worked closely with **Jim Bischoff** on theoretical and experimental studies of submarine hydrothermal, volcanic, and geothermal systems for over 22 years. In 1996, he teamed up with **Keith Kvenvolden** to develop an integrated organic, inorganic, experimental laboratory capability to facilitate research investigations of geologic processes to help understand natural and human-induced stresses on the environment. His diverse research interests include the use of signature lipid biomarkers and stable isotopes to study nearshore ecosystem processes, changes in microbial diversity in marine sediment linked to contaminants, and the paleo-occurrence of hypoxia in deltaic systems. He has led efforts to assess the risk of contaminated floodwater sediment to human and ecosystem health in the aftermath of Hurricanes Katrina and Rita and the potential environmental and human-health impacts of the mud volcano in East Java at Sidoarjo. He participated in studies on saline encroachment in the Los Angeles Basin and on hydrocarbon occurrence along the California coast and in the Monterey Bay National Marine Sanctuary. He led the effort to chemically fingerprint and determine the persistence and degradation pathways of oil from recent spills in San Francisco Bay from the merchant vessel *Cosco Busan* and in the Gulf of Mexico from the Deepwater Horizon explosion.

Currently, **Bob** is leading studies on the experimental investigation, theoretical modeling, and environmental impacts of



CO_2 sequestration in geologic formations with colleagues from the national and international scientific community. He is also a part of a large effort to quantify sediment-transport pathways in the San Francisco Bay coastal system by utilizing a combination of Sr and Nd isotopes and rare-earth-element distributions. **Bob** is the author or coauthor of over 100 peer-reviewed scientific publications. **Bob** is known for his tireless and balanced approach to critical science and management excellence and will bring these elements to the Center Director's Office.

I also want to acknowledge the previous PCMSC Acting Directors, **Jill McCarthy**, **Debbie Hutchinson**, and **Bill Schwab**, for their many contributions over the past year.

USGS Fact Sheet Summarizes Estimates of Sediment Load from Major Rivers into Puget Sound

On September 8, 2011, the U.S. Geological Survey (USGS) released Fact Sheet 2011-3083, which summarizes estimates of sediment load from major rivers into Puget Sound and its adjacent waters, and the uncertainties of these estimates. Rivers carry freshwater into Puget Sound, as well as sediment and other materials, such as wood, important to estuarine and nearshore habitat, aquatic ecology, and water quality. When sediment delivery is depleted, nearshore critical habitat and beaches can be eroded by natural coastal processes and lost. The Fact Sheet reports that an estimated load of 6.5 million tons of sediment is transported annually by rivers to Puget Sound and its adjacent waters; however, this estimate is highly uncertain because sediment studies and available sediment-load data are sparse and historically limited to specific rivers, short time frames, and a narrow range of hydrologic conditions. The Fact Sheet concludes that "detailed monitoring and analytical understanding of sediment load, size, quality, and movement are needed to best understand, protect, and restore important ecosystem processes and functions in Puget Sound."

The full citation for the new Fact Sheet is:

Czuba, J.A., Magirl, C.S., Czuba, C.R., Grossman, E.E., Curran, C.A., Gendaszek, A.S., and Dinicola, R.S., 2011, Sediment load from major rivers into Puget Sound and its adjacent waters: U.S. Geological Survey Fact Sheet 2011-3083, 4 p. [**http://pubs.usgs.gov/fs/2011/3083/**].

Recently Published Articles

Cronin, K., van Ormondt, M., Storlazzi, C., Presto, K., and Tonnon, P., 2011, Nearshore disposal of fine-grained sediment in a high-energy environment; Santa Cruz Harbor case study, *in* Rosati, J.D., Wang, P., and Roberts, T.M., eds., Proceedings of the Coastal Sediments 2011, v. 1: Hackensack, N.J., World Scientific Publishing [**http://ebooks.worldscinet.com/ISBN/9789814355537/9789814355537_0047.html**], p. 616-627.

Cross, V.A., Bratton, J.F., Worley, C.R., Crusius, J., and Kroeger, K.D., 2011, Continuous resistivity profiling data from the Corsica River Estuary, Maryland: U.S. Geological Survey Open-File Report 2010-1094, DVD [**http://pubs.usgs.gov/of/2010/1094/**].

Czuba, J.A., Magirl, C.S., Czuba, C.R., Grossman, E.E., Curran, C.A., Gendaszek, A.S., and Dinicola, R.S., 2011, Sediment load from major rivers into Puget Sound and its adjacent waters: U.S. Geological Survey Fact Sheet 2011-3083, 4 p. [**http://pubs.usgs.gov/fs/2011/3083/**].

Draut, A.E., 2011, Vegetation and substrate properties of aeolian dune fields in the Colorado River corridor, Grand Canyon, Arizona: U.S. Geological Survey Open-File Report 2011-1195, 16 p. [**http://pubs.usgs.gov/of/2011/1195/**].

Elias, E., Gelfenbaum, G., van Ormondt, M., and Moritz, H.R., Predicting sediment transport patterns at the mouth of the Columbia River, *in* Rosati, J.D., Wang, P., and Roberts, T.M., eds., Proceedings of the Coastal Sediments 2011, v. 1: Hackensack, N.J., World Scientific Publishing [**http://ebooks.worldscinet.com/ISBN/9789814355537/9789814355537_0045.html**], p. 588-601.

Foxgrover, A.C., Finlayson, D.P., Jaffe, B.E., Takekawa, J.Y., Thorne, K.M., and Spragens, K.A., 2011, 2010 bathymetric survey and digital elevation model of Corte Madera Bay, California: U.S. Geological Survey Open-File Report 2011-1217, 20 p., [**http://pubs.usgs.gov/of/2011/1217/**].

Ganju, N.K., Dickhudt, P.J., Thomas, J.A., Borden, J., Sherwood, C.R., Montgomery, E., Twomey, E., and Martini, M., 2011, Summary of oceanographic and water-quality measurements in West Falmouth Harbor and Buzzards Bay, Massachusetts, 2009-2010: U.S. Geological Survey Open-File Report 2011-1113 [**http://pubs.usgs.gov/of/2011/1113/**].

Griffin, D.W., 2011, The use of epifluorescent microscopy and quantitative polymerase chain reaction to determine the presence/absence and identification of microorganisms associated with domestic and foreign wallboard samples: U.S. Consumer Product Safety Commission Web site; PDF file (344 KB) at **http://www.cpsc.gov/info/drywall/USGSmicrobiological.pdf**; also available from Sept. 15, 2011, news release at **http://www.cpsc.gov/cpscpub/prerel/prhtml11/11327.html** (scroll down to link "USGS").

Grossman, E.E., George, D.A., and Lam, A., 2011, Shallow stratigraphy of the Skagit River Delta, Washington, derived from sediment cores: USGS Open File Report 2011-1194, 123 p. [**http://pubs.usgs.gov/of/2011/1194/**].

Hanes, D.M., Barnard, P.L., Dallas, K., Elias, E., Erikson, L.H., Eshleman, J., Hansen, J., Hsu, T.J., and Shi, F., 2011, Recent scientific advances and their implications for sand management near San Francisco, California; the influences of the ebb tidal delta, *in* Rosati, J.D., Wang, P., and Roberts, T.M., eds., Proceedings of the Coastal Sediments 2011, v. 1: Hackensack, N.J., World Scientific Publishing [**http://ebooks.worldscinet.com/ISBN/9789814355537/9789814355537_0036.html**], p. 472-483.

Lescinski, J., van Ormondt, M., and Warrick, J., 2011, Beach nourishment with a high percentage of fine sediments; a modeling study of the Tijuana Fate and Transport Project, California, *in* Rosati, J.D., Wang, P., and Roberts, T.M., eds., Proceedings of the Coastal Sediments 2011, v. 1: Hackensack, N.J., World Scientific Publishing [**http://ebooks.worldscinet.com/ISBN/9789814355537/9789814355537_0004.html**], p. 43-56.

Miller, G., and Dadisman, S., 2011, Coastal and Marine Geoscience Data System: U.S. Geological Survey Web page, **http://cmgds.marine.usgs.gov/**.

(Recently Published continued on page 18)

(Recently Published continued from page 17)

Moore, L., List, J.H., Williams, S.J., and Patsch, K., 2011, Barriers on the brink? The complex intertwined roles of geologic framework, sediment availability and sea-level rise in island evolution, *in* Rosati, J.D., Wang, P., and Roberts, T.M., eds., Proceedings of the Coastal Sediments 2011, v. 1: Hackensack, N.J., World Scientific Publishing [**http://ebooks.worldscinet.com/ISBN/9789814355537/9789814355537_0021.html**], p. 272-285.

Rosenberger, K., Noble, M.A., Sherwood, C.R., Martini, M.M., Ferreira, J.T., and Montgomery, E., 2011, Palos Verdes Shelf oceanographic study; data report for observations December 2007-April 2008: U.S. Geological Survey Open-File Report 2010-1240, 118 p. [**http://pubs.usgs.gov/of/2010/1240/**].

Sallenger, A.H., 2011, Hurricanes, sea level rise, and coastal change, *in* Rosati, J.D., Wang, P., and Roberts, T.M., eds., Proceedings of the Coastal Sediments 2011, v. 1: Hackensack, N.J., World Scientific Publishing [**http://ebooks.worldscinet.com/ISBN/9789814355537/9789814355537_0002.html**], p. 15-28.

Storlazzi, C.D., Field, M.E., Elias, E., and Presto, M.K., 2011, The influence of sea level rise on fringing reef sediment dynamics; field observations and numerical modeling, *in* Rosati, J.D., Wang, P., and Roberts, T.M., eds., Proceedings of the Coastal Sediments 2011, v. 1: Hackensack, N.J., World Scientific Publishing [**http://ebooks.worldscinet.com/ISBN/9789814355537/9789814355537_0019.html**], p. 244-257.

Zawada, D.G., Hart, K.M., Fujisaki, I., and Lidz, B.H., 2011, Revealing habitat-use patterns of loggerhead sea turtles during inter-nesting periods [abs.]: Association of Marine Laboratories of the Caribbean Scientific Conference, 35th, San José, Costa Rica, May 23-27, 2011, Program and Abstracts, p. 41.

Publications Submitted for Bureau Approval

Armstrong, B.N., Warner, J.C., Voulgaris, G., List, J.H., Thieler, E.R., and Martini, M.A., Carolinas Coastal Change Processes project data report for observations near Diamond Shoals, NC, from January-April 2009: U.S. Geological Survey Open-File Report 2011-1156.

Bonisteel-Cormier, J.M., Nayegandhi, A., Fredericks, X., Klipp, E.S., Nagle, D.B., Vivekanandan, S., Wright, C.W., Sallenger, A.H., and Brock, J.C., EAARL coastal topography—Virginia, Post-Nor'Ida, 2009: U.S. Geological Survey Data Series.

Erikson, L.H., Barnard, P.L., Ruggiero, P., Eshleman, J.E., and van Ormondt, M., A semi-deterministic approach for projecting inundation extents along a complex coastline using global climate model outputs [abs.]: European Conference on FLOODrisk Management, 2nd, Rotterdam, the Netherlands, November 20-22, 2012.

Foxgrover, A.C., Finlayson, D.P., and Jaffe, B.E., 2010 bathymetry and DEM of Coyote Creek and Alviso Slough, South San Francisco Bay, California: U.S. Geological Survey Open-File Report.

Galkiewicz, J.P., Vega Thurber, R., and Kellogg, C.A., Metagenomic analysis of the microbial community associated with *Lophelia pertusa* [abs.]: International Coral Reef Symposium, 12th, Cairns, Queensland, Australia, July 9-13, 2012.

Gelfenbaum, G., Richmond, B.M., Morton, R.A., and Buckley, M.L., Complex inundation, erosion, and deposition along the Chile coast during the 27 February 2010 Chile tsunami [abs.]: Ocean Sciences Meeting, Salt Lake City, Utah, February 20-24, 2012.

Goldfinger, C., Nelson, C.H., Johnson, J.E., Morey, A.E., Guitiérrez-Pastor, J., Karabanov, E., Eriksson, A.T., Grácia, E., Dunhill, G., Patton, J., Enkin, R., Dallimore, A., Vallier, T., and the shipboard scientific parties, Turbidite event history; methods and implications for Holocene paleoseismicity of the Cascadia subduction zone: U.S. Geological Survey Professional Paper 1661-F.

Gutierrez, B.T., Plant, N.G., and Thieler, E.R., A Bayesian network to predict vulnerability to sea-level rise; data report: U.S. Geological Survey Digital Data Series 601.

Kim, J.H., Torres, M.E., Haley, B.A., Kastner, M., Pohlman, J.W., Riedel, M., and Lee, Y.L., The effect of diagenesis and fluid migration on rare earth element distribution in pore fluids of the northern Cascadia accretionary margin: Chemical Geology.

Kleppe, J.A., Brothers, D.A., Kent, G.M., Biondi, F., Jensen, S., and Driscoll, N.W., Duration and severity of Medieval drought in the Lake Tahoe Basin: Quaternary Science Reviews.

Kuffner, I.B., and Hickey, T.D., Calcification over space and time in the subtropical Florida Keys, U.S.A. [abs.]: International Coral Reef Symposium, 12th, Cairns, Queensland, Australia, July 9-13, 2012.

Lacy, J.R., Gladding, S., Brand, A., Collignon, A.G., and Stacey, M.T., Observations of transport of suspended sediment from shallows to channel in an estuary [abs.]: Ocean Sciences Meeting, Salt Lake City, Utah, February 20-24, 2012.

Lebedeva-Ivanova, N., Hutchinson, D.R., Chian, D., Mosher, D., Shimeld, J., Hart, P., and Jackson, R., Velocity distribution in sediments over the Canada Basin and empirical time to sedimentary thickness conversion functions for the region [abs.]: Arctic Frontiers Conference, Tromsø, Norway, January 22-27, 2012.

MacVean, L.J., and Lacy, J.R., Estuarine sediment dynamics in intertidal and subtidal environments; differences and similaritites in forcing and response [abs.]: Ocean Sciences Meeting, Salt Lake City, Utah, February 20-24, 2012.

Miselis, J.L., McNinch, J.E., and List, J.H., Interannual and storm-related evolution of nearshore morphology and its relationship to shoreline behavior [abs.]: Ocean Sciences Meeting, Salt Lake City, Utah, February 20-24, 2012.

Moore, L.J., Patsch, K., List, J.H., and Williams, S.J., Barrier islands poised for state change, Chandeleur Islands,

(Publications Submitted continued on page 19)

(Publications Submitted continued from page 18)

Louisiana, USA: Journal of Geophysical Research.

Mosher, D.C., Hutchinson, D., Shimeld, J., Mayer, L.A., and Edwards, B.D., Stratigraphy and sedimentology of the western Arctic Ocean [abs.]: International Polar Year (IPY) Conference, Montréal, Canada, April 22-27, 2012.

Noble, M.A., Rosenberger, K.J., and Robinson, G.L., Spatial and temporal structures in wind-forced, nearshore transport patterns in the central southern California bight [abs.]: Ocean Sciences Meeting, Salt Lake City, Utah, February 20-24, 2012.

Rose, K., Nayeghandi, A., Moses, C.S., Beavers, R., Lavoie, D., and Brock, J., Gap analysis of benthic mapping at three National Parks—Assateague Island National Seashore, Channel Islands National Park, and Sleeping Bear Dunes National Lakeshore: U.S. Geological Survey Open-File Report.

Sallenger, A., Doran, K., and Howd, P., Sea-level-rise acceleration and storm surges along the U.S. northeast coast [abs.]: Association of American Geographers Annual Meeting, New York, N.Y., February 24-28, 2012.

Smith, C.G., Marot, M.E., and Osterman, L.E., Influence of anthropogenic activities and natural processes on historic depositional patterns and environmental change in the Mobile Bay estuarine system, Alabama (USA) [abs.]: Ocean Sciences Meeting, Salt Lake City, Utah, February 20-24, 2012.

Storlazzi, C.D., Field, M.E., Draut, A.E., and Hoeke, R.K., Understanding the impact of terrestrial sediment on adjacent coral reefs through empirical observations and numerical modeling [abs.]: Ocean Sciences Meeting, Salt Lake City, Utah, February 20-24, 2012.

Walters, L.J., Turner, T., Kuffner, I.B., and Paul, V.J., Sea urchin foraging; impacts on coral reefs [abs.]: Society for Integrative and Comparative Biology Annual Meeting,Charleston, S.C., January 3-7, 2012.

Wright, C.W., Nayegandhi, A., Bonisteel-Cormier, J.M., and Brock, J.C., EAARL—Experimental Advanced Airborne Research Lidar: U.S. Geological Survey Fact Sheet, 4 p.

Xu, J.P., Barry, J.P., and Paull, C.K., A slow-moving turbidity current in Monterey Submarine Canyon [abs.]: Ocean Sciences Meeting, Salt Lake City, Utah, February 20-24, 2012.